Collegiate Volleyball Players' Need Fulfillment, Balance, and Well-Being

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Dedication

To my *Mom*

for highlighting the importance

of an education

&

To Dean

for his continued

and unwavering support

Abstract

Proponents of Basic Needs Theory (BNT; Deci & Ryan, 2002) contend that the mechanism underpinning psychological well-being is the fulfillment of basic psychological needs with their fulfillment addressed in an independent (Deci & Ryan, 2002) or balanced manner (Sheldon & Niemiec, 2006). The purpose of this investigation was to explore the associations between the fulfillment of basic psychological needs and two forms of psychological well-being, namely hedonic and eudaimonic indices. Employing purposive sampling and a cross-sectional design, collegiate volleyball players ($N = 219$; $n_{females} = 127$) completed a battery of self-report instruments assessing psychological need satisfaction and well-being toward the mid-to-end portion of their competitive season. Aligned with BNT (Deci & Ryan, 2002) tenets and study hypotheses, results demonstrated that basic psychological need fulfillment was associated with psychological well-being in the context of volleyball. Albeit minimal, balanced need fulfillment was generally predictive of well-being indices beyond independent need contributions with suppressor effects noted. In sum, the results of the present investigation generally coincide with previous sport based BNT (e.g., Reinboth & Duda, 2006) and balanced need satisfaction (e.g., Sheldon & Niemiec, 2006) literature. Additional BNT support has been garnished and suggests that the fulfillment of the basic psychological needs for competence, autonomy, and relatedness may be targeted as the mechanisms to facilitate athletes' psychological well-being. Along with Ryan and Deci's (2007) recommendations, the outcomes of this investigation highlight the need for further empirical study of BNT's tenets in the realm of sport including assessments of balanced need satisfaction as well as varied hedonic and eudaimonic indices.

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Although mine will be the sole name to appear on the MA degree, I know (as should the readers of this document) of those whom aided in its being printed.

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Introduction

Addressing the question "what is the good life?" has had a long standing tradition in psychological inquiry. Focusing on characteristics such as pleasure, loving others, and self-acceptance, an understanding of the factors that contribute to an individual's well-being has been undertaken. With emerging evidence supporting the notion that well-being produces desirable societal outcomes (Lyubomirsky, King, & Diener, 2005) many countries (e.g., Australia, Canada, United States of America) have begun to track well-being through various indicators. The Canadian Community Health Survey (CCHS—cycle 3.1) included an assessment of psychological well-being as an indicator of the population experiencing some form of mental ill-being. In 2007, approximately one quarter of young adults (i.e., 20 to 34 years) did not report "excellent" or "very good" perceived mental health (Statistics Canada, 2007). Not only are mental health benefits lost upon a substantial number of Canadians, the economic costs of poor mental health has been estimated to equal 14.4 billion dollars per annum (Stephens & Joubert, 2001). With the bulk of existing research addressing the questions *who* and *when* people report higher levels of well-being (Diener, 2000), recent research has centered on the processes that influence well-being (i.e., the *how*).

Documented benefits of psychological well-being have spanned social, behavioural, and physical outcomes (for a review see; Ryan, Huta, & Deci, 2008). Emergent research has noted the benefits of physical activity on psychological well-being (e.g., Grant, Wardle, & Steptoe, in press; Valois, Zullig, & Huebner, 2004). Research linking the association of physical activity to psychological well-being has translated into

the endorsement of physical activity as one means to improve psychological well-being (Canadian Mental Health Association, 2008).

Sport involvement represents one realm of physical activity in which approximately one quarter (i.e., 24%) of all Canadians, fifteen years of age and older, report spending time (Statistics Canada, 2005). Research examining the relationship between sport participation and health benefits has mirrored those reported in physical activity contexts demonstrating several psychological, behavioural, and maturational advantages (Brown & Blanton, 2002; Pate, Trost, Levin, & Dowda, 2000; Seefeldt, Malina, & Clark, 2002). As engagement in varied forms of physical activity is posited to promote well-being (Fox & Wilson, 2008), the investigation of the processes through which well-being can be enhanced reflect meaningful avenues of empirical inquiry to further existing knowledge and aid health promotion efforts. One means to address well-being enhancement is through the consideration of the fulfillment of the basic psychological needs (i.e., a posited mechanism; Deci & Ryan, 2002) in sporting contexts.

Psychological Well-Being

Psychological well-being is a multi-faceted construct riddled with varied conceptualizations and discourse surrounding the contents and processes through which well-being can be attained. Aristippus offered an extreme view in which well-being was equated with the maximization of pleasure (i.e., hedonic philosophy) at all costs, including virtue (i.e., the notion of intermediacy; Kesebir & Diener, 2008). Alternatively, Aristotle's conceptualization of happiness (i.e., eudaimonia) was concerned with self-actualization and living in accordance with virtue (Kesebir & Diener, 2008; Ryan et al.,

2008). Stemming from these philosophical origins, two approaches—hedonic and eudaimonic, to the empirical study of psychological well-being have been entertained.

The hedonic approach to understanding well-being. The hedonic approach to psychological well-being encompasses three chief components: pleasure, happiness, and the satisfaction of any desire (Ryff, Singer, & Dienberg Love, 2004). Essentially, the hedonic approach is concerned with the degree to which individual's feel happy with their life. Academics have asserted that the majority of subjective well-being (SWB; Diener, 1984) research stems from, and is indicative of, the hedonic tradition (Kesebir & Diener, 2008; Ryan et al., 2008; Ryff et al., 2004). SWB refers to individual's subjective evaluations of their lives which are comprised of cognitive judgments (i.e., life/domain satisfaction) and affective appraisals (i.e., positive and negative affect; Kesebir & Diener, 2008).

Burgeoning research interest into SWB has identified various conclusions, including: 1) that the majority of individual's score above the midpoint on instruments assessing hedonic well-being suggesting that on average people are satisfied with their lives and experience more positive affect than negative, and 2) that various correlates of SWB exist spanning socio-demographic, personality, and physical health outcomes (Biswas-Diener, Vittersø, & Diener, 2005; Kesebir & Diener, 2008). While socio-demographic information accounts for minimal variance in SWB (Diener, Suh, Lucas, & Smith, 1999) key trends have been identified. For instance, aging has demonstrated positive associations with life satisfaction, fluctuations with positive affect, and a plateau in negative affect (Diener & Suh, 1998). Marital status (i.e., being married) has consistently demonstrated associations with SWB, although this association may be

somewhat culturally dependent (Diener et al., 1999). Socio-economic indicators (e.g., wealth/income) have demonstrated that wealthier individuals' tend to experience higher levels of SWB with a threshold noted, whereby income beyond that necessary to subsist does not translate to greater SWB (Kesebir & Diener, 2008). Adopting national indicators of socio-economic status on SWB has resulted in equivocal findings (Bjornskov, Gupta, & Pedersen, 2008). The socio-demographic variables of gender and education reflect non-statistically significant and indirect relationships with SWB, respectively (Diener et al., 1999).

Personality factors have been identified as the foremost predictors of trait SWB (Diener et al., 1999; Kesebir & Diener, 2008). In a meta-analysis, Steel, Schmidt, and Shultz (2008) examined the role personality factors play with respect to SWB. Personality factors were found to account for 39 percent of the total variance in SWB (Steel et al., 2008) with extraversion and neuroticism implicated as the two traits exerting the greatest influence (Diener et al., 1999; Larsen & Eid, 2008). Such findings are consistent with behavioural genetic studies which are suggestive of SWB's moderately heritable nature (Lykken, 1999; Weiss, Bates, & Luciano, 2008).

Finally, there is accumulating evidence that SWB is associated with various markers of physical health (Howell, Kern, & Lyubomirsky, 2007). Individual's reporting higher levels of SWB were found to be less susceptible to a common cold/flu virus injection than those with lower levels of SWB (Cohen, Doyle, Turner, Alper, & Skoner, 2003; Cohen, Alper, Doyle, Treanor, & Turner, 2006). Extending the above to long term physical health, Danner, Snowdan, and Friesen (2001) have demonstrated that positive

affect predicted longevity. Thus, levels of SWB may influence an individual's short and long term physical health.

The eudaimonic approach to understanding well-being. Hedonic well-being portrays human nature as a passive condition (Chatzisarantis & Hagger, 2007) with researchers beginning to advocate for consideration into the role of intentional activities (i.e., the active condition) as one means to increase and sustain SWB (Lyubomirsky, Sheldon, & Schkade, 2005). The philosophical conceptualization of eudaimonia, alternatively, establishes human nature to be an active process (Chatzisarantis & Hagger, 2007) and based more so on seeking optimal challenges in an effort to reach their full potential and uncovering their life's meaning than happiness. Eudaimonia is a psychological approach to well-being concerned with living a complete human life and optimal functioning (Deci & Ryan, 2000; Ryan et al., 2008). Eudaimonic conceptualizations of well-being focus on the content of one's life and the processes involved in living well. Within health based psychological literature, three varied conceptualizations of eudaimonic well-being are routinely employed. Waterman's (1993; 2007) depiction of eudaimonia concerns an assessment of personal expressiveness in specific activities. Ryff and Singer (2006) specify six spheres (i.e., Self-Acceptance, Personal Growth, Purpose in Life, Positive Relationships, Autonomy, and Environmental Mastery) of psychological well-being which are posited to comprise eudaimonic living. Lastly, Ryan and colleagues (2008) suggest that eudaimonia is a process of living well with vitality and mindfulness advocated as being indicative of this process. Deci and Ryan (2002) further identify the mechanisms, specifically the fulfillment of basic psychological needs, through which eudaimonic well-being can be achieved. Despite

differences amongst these conceptualizations in scope and prescriptive nature (Kesebir & Diener, 2008; Ryan et al., 2008), each depiction of eudaimonia concerns the realization of one's true self and not merely deriving pleasure from life.

Consistent with research examining SWB, population health research suggests that individuals on average report higher (as opposed to lower) levels of eudaimonic well-being (Abbott, Ploubidis, Huppert, Kuh, Wadsworth, & Croudace, 2006). Socio-demographic correlates of eudaimonic well-being have demonstrated a consistent, yet differentiated, association with aging dependent upon the employed marker (Ryff & Singer, 2008). Higher levels of education, occupational and marital status have demonstrated associations with heightened eudaimonic well-being (Bierman, Fazio, & Milkie, 2006; Lindfors, Bernstrom, & Lundberg, 2006; Ryff & Singer, 2008). Income has demonstrated minimal relation with eudaimonic well-being (Triado, Villar, Sole, & Celdran, 2007). With consideration to personality traits, extraversion and neuroticism have emerged as consistent predictors (Schmutte & Ryff, 1997).

Evidence suggests that the absence of eudaimonic well-being, rather than the presence of ill- or hedonic well-being, is more directly linked with mortality, health, or disease status (Clark & Watson, 1991; Huppert & Whittington, 2003). As such, physical health has been associated with eudaimonic well-being in a complementary and unique fashion to that endorsed by hedonic markers of well-being. More specifically, lessened disease/symptom severity, fewer diagnosed illnesses, a lower frequency of physical symptoms, healthier habits, as well as, improved sleeping patterns and brain circuitry have all been associated with higher levels of eudaimonic well-being (Barrett, Della-Maggiore, Chouinard, & Paus, 2004; Brown & Ryan, 2003; Hayney, Dienberg Love,

Buck, Ryff, Singer, & Muller, 2003; Heidrich & Ryff, 1995; Friedman, Hayney, & Dienberg Love, 2007; Keyes & Ryff, 2003; Sirios, Davis, & Morgan, 2006; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Ryan & Frederick, 1997; Ryff, et al., 2004).

Hedonic and eudaimonic well-being: Are they distinct? Although not uniformly endorsed (e.g., Kashdan, Biswas-Diener, & King, 2008), researchers have argued that SWB and eudaimonic well-being are related yet distinct facets of optimal psychological functioning with a pattern of moderate associations demonstrated (e.g., Ryff et al., 2004; Ryan et al., 2008). Such a contention has been supported across empirical well-being investigations of personality (Keyes, Shmotkin, & Ryff, 2002), biological markers of physical health (Howell et al., 2007; Ryff et al., 2004), and behaviour (Steger, Kashdan, & Oishi, 2008). For instance, Nix and colleagues (Nix, Ryan, Manly, & Deci, 1999) altered the conditions in which participants completed various tasks and investigated the resultant well-being outcomes. While under controlled or pressured conditions, SWB was endorsed, yet the expression of eudaimonic well-being was hindered. In contrast, more autonomous conditions fostered the endorsement of SWB as well as eudaimonic well-being. Lastly, confirmatory factor analyses conducted by Gallagher, Lopez, and Preacher (2009) demonstrated that hedonic and eudaimonic indicators best fit sample data when construed as separate constructs. In sum, empirical findings support the proposition that SWB and eudaimonic well-being work in a cooperative fashion with distinguishable contributions.

The Utility of Theoretical Frameworks in Empirical Inquiry. The importance of understanding how forms of psychological well-being relate to various correlates is informative, yet, offers limited utility beyond mere description. Through the use of a

theoretical framework, researchers are able to *select relevant* contributors (i.e., predictors) and provide essential context for findings (i.e., explanation) of various phenomenon beyond description. Glanz and colleagues (Glanz, Lewis, & Rimer, 1997) defined theory as,

> "A set of interrelated concepts, definitions, and propositions that presents a systematic view of events or situations by specifying relations among variables in order to explain and predict events or situations."

Highlighting the inextricable connection between theory and practical application, Kurt Lewin (1951) noted that "there is nothing so practical as a good theory." For researchers and health promotion specialists to successfully aid in the betterment of an individual's psychological well-being, a theoretical blueprint identifying relevant constructs, generating hypotheses, and explaining the mechanisms influencing psychological well-being is important. While varied psychological well-being (e.g., Set Point Theory, Lykken & Tellegen, 1996; Multidimensional Model of Psychological Well-being, Ryff & Singer, 2008) and health behaviour theories (e.g., Theory of Planned Behaviour, Ajzen, 1991) exist, many lack suppositions concerning the specific processes through which psychological well-being develops. Conversely, Self-Determination Theory (SDT; Deci & Ryan, 1985; 2002) represents a viable theoretical approach to further develop an understanding of possible mechanisms responsible for psychological well-being.

Self-Determination Theory

SDT (Deci & Ryan, 2002) is an organismic-dialectical approach to human growth, development, and motivation. With four mini-theories comprising SDT's framework (i.e., Causality Orientations Theory, COT; Cognitive Evaluation Theory,

CET; Organismic Integration Theory, OIT; and Basic Needs Theory, BNT), the dynamic between individual's and the challenges associated with assimilating and adapting to their social environment has been depicted (Deci & Ryan, 2002). COT addresses personality-level constructs to examine differences in how individuals' are oriented towards self-determined versus controlled functioning across life domains (Deci & Ryan, 2002). CET concerns the conditions associated with behavioural engagement for intrinsic motives (Deci & Ryan, 2002). OIT consists of a differentiated approach to understanding extrinsic behavioural regulatory styles which vary in degree of internalization from most to least autonomous (i.e., integrated, identified, introjected, and external regulation, respectively; Deci & Ryan, 2002). Endorsement of more autonomous (i.e., self-determined) motives in OIT are positively associated with behavioural engagement and well-being (e.g., McDonough & Crocker, 2007; Wilson, Mack, Muon, & LeBlanc, 2007). Of the four mini-theories, BNT identifies and extrapolates upon the concept of basic psychological need satisfaction as fundamental to promoting psychological health and well-being (Deci & Ryan, 1985; 2002).

What is a Psychological Need?

Psychological needs represent a unique compliment to the understanding of motivation as such concepts are prescriptive in nature. Needs, as operationalized within SDT, represent "innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being." (Deci & Ryan, 2000, p.229) as opposed to any motivating impulse (e.g., desires; Ryan, 1995). Psychological needs are qualitatively different from physiological needs which are more biologically driven and consequentially, reactive. Basic psychological needs are conceptualized as proactive as

they promote engagement in environments expected to nurture our needs. Moreover, basic psychological needs are posited to be innate, compatible, and produce universally positive effects when satisfied (Ryan & Deci, 2002). Individual differences coupled with any given social context may lead to need fulfillment (or thwarting) which in turn optimizes (or hampers) an individual's potential. Proponents contend that there are (at least) three basic needs, specifically, competence, autonomy, and relatedness which are elemental to SDT (Deci & Ryan, 2002). Competence refers to feeling proficient in dealing with optimal challenges presented within ones' social milieu (White, 1963; Deci & Ryan, 2002). Autonomy involves a sense of volition in which individual's feel self-determined in choosing their actions rather than feeling controlled or obliged (deCharms, 1968; Deci & Ryan, 2002). Relatedness reflects the need for satisfying and supportive social relationships (Baumeister & Leary, 1995; Deci & Ryan, 2002).

Basic Needs Theory: A Review of the Evidence

Consistent with theoretical suppositions (Deci & Ryan, 2002), the need fulfillment-well-being relationship has been demonstrated with positive small-to-moderate effects across varied samples (e.g., children, law students, and in non-Western cultures; Deci, Ryan, Gagné, Leone, Usunov, & Kornazheva, 2001; Sheldon & Krieger, 2007; Vansteenkiste, Lens, Soenens, & Luyckx, 2006; Véronneau, Koestner, & Abala, 2005). Corroborating the aforementioned findings, mediation analyses have provided further evidence for the likelihood of a direct relationship between need satisfaction and well-being (Meyer, Enström, Harstveit, Bowles, & Beevers, 2007). Extending results from the non-experimental designs identified, longitudinal support attesting to the tenets embedded within BNT have been documented. Sheldon, Ryan, and Reis (1996) examined

need fulfillment for competence and autonomy with indices of well-being across two levels of analyses (i.e., between-subjects and within-person) in a college sample for a period of two weeks. Individuals high in trait competence/autonomy were found to have better days (i.e., well-being) than their characteristically low need fulfillment counterparts. Further, fluctuations in daily need satisfaction were found to predict fluctuations in daily well-being (Sheldon et al., 1996). To be fully inclusive of all needs postulated by Deci and Ryan (2002), Reis and colleagues (Reis et al., 2000) replicated the aforementioned results with the inclusion of the need for relatedness.

Support for BNT propositions have been advanced across several domains and varied methodological designs. Movement across varied domains advances SDT tenets as it affords the opportunity to differentiate general theoretical postulates in a priori settings (Ryan, 1995). Further, Ryan (1995) contends that domain specific research is essential due to the applied significance which it affords.

Basic Needs Theory in the Context of Physical Activity: A Review of the Evidence

Specific to physical activity domains, the predominant focus of basic psychological need based research within SDT's literature has been behavioural regulation (e.g., Hollembeak & Amorose, 2001; Standage, Duda, & Ntoumanis, 2005; Vallerand, 1997; Wilson, Rodgers, Blanchard, & Gessell, 2003). Such literature has identified that greater need fulfillment is associated with more self-determined forms (as opposed to less self-determined) of behavioural regulation (e.g., Standage et al., 2005). Research concerning the basic psychological need-well-being relationship has recently emerged in the physical activity literature with support offered for BNT tenets. Within physical education contexts, cross-sectional data has demonstrated positive small-to-

moderate associations between need satisfaction and varied markers of well-being (Standage & Gillison, 2007) and negative associations between need satisfaction and ill-being (Ntoumanis, 2005). Furthermore, Standage and Gillison (2007) revealed the existence of 'direct' paths leading from competence and relatedness fulfillment to markers of well-being. Although scarce in comparison to non-physical activity based contexts, findings from physical education settings coincide with BNT postulates and exercise based SDT literature.

Exercise is structured physical activity that is characterized by repetitive bodily movements done to improve or maintain one or more of the components of physical fitness (Bouchard, Blair, & Haskell, 2007). In their systematic review, Wilson, Mack, Gunnell, Oster, and Gregson (2008) examined basic psychological need fulfillment in exercise contexts. Need fulfillment was examined in association with varied outcomes, yet, less than one quarter of the studies examined included measures of well-being as required to test BNT tenets (Wilson et al., 2008). Where BNT has been tested, theoretically meaningful results employing both cross-sectional and longitudinal research designs were noted. In accordance with BNT suppositions, researchers collecting data at one point in time have revealed positive small-to-moderate relationships between basic psychological need satisfaction and diverse markers of well-being (e.g., Wilson, Longley, Muon, Rodgers, & Murray, 2006; Wilson, Mack, Blanchard, & Gray, 2009; Wilson, Mack, & Lightheart, 2008). In 2006, Wilson and colleagues assessed basic need fulfillment and a marker of well-being in an exercise context on two occasions. At each point in time, positive small-to-moderate associations were demarcated between psychological need satisfaction and well-being. Further, fluctuations in the satisfaction of

the needs for competence and autonomy systematically varied with changes in well-being over time (Wilson et al., 2006).

Additional longitudinal support in exercise contexts for BNT has been generated across two studies by Edmunds and colleagues (Edmunds, Ntoumanis, & Duda, 2007; Edmunds, Ntoumanis, & Duda, 2008). Across a 3 month span, Edmunds et al. (2007) found that in general psychological need satisfaction correlated in the hypothesized direction with three markers of well-being for a sample of overweight and obese individuals'. Moreover, fulfillment of the need for autonomy positively predicted one measure of well-being (i.e., satisfaction with life) and autonomy fulfillment accounted for increasing amounts of variance in well-being across time (Edmunds et al., 2007). Building on her earlier work, Edmunds et al. (2008) examined the need fulfillment-well-being relationship in a sample of female university staff and students who enrolled blindly into a SDT based (i.e., received an autonomy supportive teaching style) or traditional (i.e., 'control' group) exercise class. Following the manipulation, those receiving exercise instruction in an autonomy supportive manner demonstrated higher need satisfaction and subsequent well-being despite having lower well-being reports than the control group at baseline (Edmunds et al., 2008). Although in its infancy, results stemming from SDT's exercise based research have produced additional support for BNT postulates.

Sport reflects a unique physical activity context where rules or customs govern competitive play. The empirical study of athletes and mental health has been bountiful (e.g., Stephan, Bilard, Ninot, & Delignieres, 2003; Watson & Kissinger, 2007) but riddled with inconsistent findings regarding well-being (e.g., Chatzisarantis & Hagger,

2007; DiBartolo & Shaffer, 2002); however, within the realm of BNT little research exists. Adopting cross-sectional strategies, research conclusions from sporting contexts have mirrored those reported in other physical activity contexts with small-to-moderate positive relationships between need satisfaction and various markers of well-being noted (Reinboth, Duda, & Ntoumanis, 2004; Smith, Ntoumanis, & Duda, 2007). Mediation analyses have demonstrated that need fulfillment positively and directly related to well-being in a sample of adolescent male athletes (Smith et al., 2007). With respect to the need satisfaction-well-being association, longitudinal studies sampling athletes have demonstrated relationships akin to cross-sectional data (Gagné, Ryan, & Bargmann, 2003; Reinboth & Duda, 2006) and positive moderate effects (Amorose, Anderson-Butcher, & Cooper, 2009). In 2003, Gagné and colleagues conducted a 4-week diary design study amongst female gymnasts during their off-season. Among other variables examined, need satisfaction afforded by gymnastics practice and multiple markers of well-being were assessed within-subjects via hierarchical linear modeling analyses. Subsequent results indicated that fulfillment of the needs for competence, autonomy, and relatedness during practice correlated with increases in each marker of well-being post-practice regardless of pre-practice motives.

Unlike Gagné and colleagues (2003), two sport based publications examined the need-satisfaction-well-being relationship at two points in time during the competitive season (Amorose et al., 2009; Reinboth & Duda, 2006). Amorose and colleagues (2009) investigated tenets of BNT in a sample of female adolescent volleyball players, whereby, pre- and end of season reports of need satisfaction in sport were regressed on well-being at the end of season. Pre-season reports of need satisfaction were unrelated to end of

season well-being. Conversely, end of season need satisfaction (i.e., competence and autonomy while relatedness was deemed an insignificant predictor) was moderately related and accounted for 34 percent of the variance in well-being at the seasons end. Similar to Amorose and colleagues (2009), Reinboth and Duda (2006) demonstrated that aspects of autonomy fulfillment in sport predicted well-being. However, in stark contrast to Amorose and associates (2009) results, competence did not emerge as a significant predictor yet relatedness in sport did explain additional variance in well-being (Reinboth & Duda, 2006). Moreover, mediation analyses once again afforded partial support for the direct relationship between need satisfaction and well-being as stated within BNT.

Balance and Psychological Need Satisfaction

Deci and Ryan (2002) have stipulated that the basic psychological needs work in a complementary fashion (i.e., non-antagonistic). With moderate associations consistently noted between the fulfillment of basic psychological needs in SDT-based literature (e.g., Wilson et al., 2006; Reinboth & Duda, 2006), preliminary empirical support for Deci and Ryan's (2002) *complementary* postulate has been afforded. Further, BNT advocates (e.g., Deci & Ryan, 2000) posit that the fulfillment of *all* three basic needs (i.e., competence, autonomy, and relatedness) will directly and positively influence psychological well-being. An abundance of empirical evidence from various domains has supported this theoretical tenet (e.g., Reis et al., 2000; Wilson et al., 2006) employing an additive (i.e., independent) approach. The independent approach is concerned with the effects of the fulfillment of a lone basic psychological need, at the exclusion of the others, with an outcome variable and implicitly *discounts* the notion of complementary synergism.

Extrapolating upon the independent approach and to be inclusive of the complementary nature of basic psychological need fulfillment, Sheldon and Niemiec (2006) conceptualized balanced psychological need fulfillment. Balanced psychological need fulfillment is concerned with the unified effects of the basic psychological needs with an outcome variable of interest. Moreover, balanced need fulfillment reflects the divergences in need fulfillment with respect to each possible pairing of the three basic psychological needs. To comprehend these complex approaches to the examination of basic psychological need fulfillment imagine the following *hypothetical* organismic scenario: A new factory has recently opened and produces bags of fertilizer with the following *optimal* composition: 7 of each Carbon, Nitrogen, and Oxygen atoms which work in a complementary manner and are responsible for various plant characteristics (e.g.., height and leaf size). The first two bags of fertilizer off the line, due to start-up issues, received differing amounts of essential plant nutrients. Plant A received fertilizer from a bag with the following composition: 7 Carbon, 3 Nitrogen, and 6 Oxygen atoms. Plant B's bag of fertilizer contained 4 Carbon, 4 Nitrogen, and 5 Oxygen atoms. According to the independent model, Plant A will be more physically well than Plant B as it has a *higher* total number of atoms (i.e., 16 versus 13, respectively). When assuming a balanced perspective, Plant B would be deemed more physically well as there are more discrepancies across the nutrients received by Plant A (2 versus 8, respectively; see Endnote [1]). Neither plant would appear physically well next to a plant receiving 7 of each type of atom as neither has the maximum amount of required nourishment. Compared to an optimally fertilized plant, Plant A would display discrepancies in growth (e.g., tall plant with suspiciously small leaves) due to the imbalance across the required atoms.

Alternatively, Plant B would most likely appear to be stunted as it shortcoming are more proportionate (e.g., medium height and leaf size).

In 2006, Sheldon and Niemiec examined the alternative route to that of independent contributions of the needs to well-being, namely balanced psychological need fulfillment with markers of SWB.[1] Sheldon and Niemiec (2006) found that individuals who reported less variability (i.e., more balance) across the three basic needs demonstrated higher levels of SWB. Stemming from Sheldon and Niemiec's (2006) seminal work, few publications (e.g., Anderson-Butcher & Amorose, 2008; Perreault, Gaudreau, Lapointe, & Lacroix, 2007) have examined the notion of balanced need satisfaction. Unlike Sheldon and Niemiec's (2006) investigation, both Perreault and colleagues (2007) and Anderson-Butcher and Amorose (2008) examined balanced need satisfaction in sport with a marker of ill-being (i.e., athlete burnout) with somewhat contradictory findings. Perreault and colleagues (2007) demonstrated a negative association between balanced need satisfaction and burnout. Further balanced need fulfillment contributed to athlete burnout beyond that found for independent effects in two of four variables. Anderson-Butcher and Amorose (2008) illustrated a similar relationship between balanced need fulfillment and burnout, however, only the contribution of independent need fulfillment achieved statistical significance. Although indices of hedonic and ill-being have been investigated, albeit minimally, eudaimonic well-being has yet to be examined in conjunction with balanced need satisfaction. As the conceptualization of balanced need fulfillment is compatible with the philosophical origins of eudaimonia, this line of inquiry holds inherent value. As such, further

examination of BNT/basic psychological need fulfillment-well-being relationship is warranted to replicate and extrapolate upon recent findings.

Statements of Research Purpose

i. To examine the pattern of relationships between psychological need satisfaction and well-being. More specifically, the patterns of association between the psychological needs for competence, autonomy, and relatedness and hedonic and eudaimonic forms of well-being were explored in a sample of collegiate volleyball players.

ii. As the independent contributions of competence, autonomy, and relatedness are addressed in the first research statement, the second concerns the examination of the relationship between 'balanced' psychological need satisfaction with hedonic and eudaimonic forms of well-being.

Hypotheses

i. Consistent with Deci and Ryan's (2002) theoretical propositions and existing literature (e.g., Gagné et al., 2003), a positive relationship between psychological need satisfaction and well-being was hypothesized.

ii. Based upon Sheldon and Niemiec's (2006) findings, it was hypothesized that individual's reporting less variability (i.e., more balanced) across need satisfaction would demonstrate higher levels of hedonic well-being. Previous literature has yet to examine balanced need satisfaction with markers of eudaimonic well-being. As such, no specific hypotheses were forwarded.

iii. Given the equivocal nature of the extant literature (Anderson-Butcher & Amorose, 2008; Perreault et al., 2007; Sheldon & Niemiec, 2006), hypotheses

were not advanced specific to the unique contributions of balanced need satisfaction.

Study Significance

With varied conceptualizations of well-being applied in the health related literature, one dimension—that of eudaimonic well-being, is minimally understood in comparison to its hedonic counterpart (Gagné & Blanchard, 2007). Critics of distinguishing between hedonic and eudaimonic forms of well-being contend that these constructs may be mechanisms which operate simultaneously (Kashdan et al., 2008). As such, the separate examination of hedonic and eudaimonic well-being as outcomes in a sport setting may serve to a) expand upon the underrepresented eudaimonic based literature and b) offer additional support to those advocating for similar (Kashdan et al., 2008) or disparate (Ryan et al., 2008) constructs. Moreover, previous studies (e.g., Gagné et al., 2003) in the realm of sport have assessed markers of both hedonic and eudaimonic well-being, yet, minimal attention to interpreting the similarities of the two forms of well-being has been afforded. Subsequently, highlighting the divergent characteristics of hedonic and eudaimonic well-being within BNT's framework may further underline their distinct qualities within the domain of sport (Gagné & Blanchard, 2007).

Despite efforts to advance the literature examining BNT tenets within the realm of sport, Ryan and Deci (2007) stipulated that such investigation requires further attention. To this end, the present investigation may contribute to our existing knowledge base centering on the role of need fulfillment and well-being in sport settings. First, Ryan and Deci (2007) advocate for the incorporation of additional eudaimonic indices, namely mindfulness, in the realm of sport. As such, the employment of Brown and Ryan's (2003)

mindfulness assessment was incorporated. Next, the sampling frame for the present study afforded further evidence with respect to the claim of the basic psychological needs' innate nature and contributes to external validity (Messick, 1995). Previous sport based publications have rarely sampled English speaking Canadian athletes and the predominant focus has been on high school aged athletes (e.g., Amorose et al., 2009; Gagné et al., 2003; Reinboth et al., 2004). Additionally, limited evidence (i.e., Reinboth & Duda, 2006) has been afforded across gender within a single empirical study pertaining to BNT tenets in sport. A sampling frame which is gender inclusive may better serve the advancement of need based well-being research and support Deci and Ryan's (2002) claim specific to the universality of effects. As the innate nature of the basic needs posited within SDT continues to be criticized (e.g., Buunk & Nauta, 2000), amassing evidence in this regard remains essential.

A second extrapolation concerns recent instrumentation developments. Traditionally, researchers relied on the utilization of adapted instruments for the assessment of basic need fulfillment in sport (e.g., Reinboth & Duda, 2006; Reinboth et al., 2004) as no context specific instrument had been developed. Recently, Gillet and colleagues (Gillet, Rosnet, & Vallerand, 2008) published such an instrument (i.e., Basic Need Satisfaction in Sport Scale) in French and voluntarily translated it into English for the purposes of this investigation. The utilization of this new instrument may benefit BNT literature by providing preliminary construct validation of the a) translated version and b) previously incorporated adapted measures. Secondly, an analysis of balanced need satisfaction as developed by Sheldon and Niemiec (2006) will expand BNT literature through a) exploring need fulfillment in a non-independent manner and b) the

examination of eudaimonic markers and well- as opposed to ill-being in the context of sport.

Finally, data collection across existing BNT sport literature has few studies reporting evidence collected in the mid-to-late competitive season time span. As Cresswell and Eklund (2005) have noted time may be a critical factor for ill-being outcomes in sport, time may also play a similar role in well-being. As such, a gap in data collection for a specific period in a competitive season may retract from the existing sport based well-being information.

Methods

Participants

Implementing non-probability based purposive sampling techniques, the target sample size (i.e., $N = 84$) was exceeded with a total of two hundred and nineteen participants providing 'complete' data from various collegiate volleyball teams (i.e., Canadian College Athletic Association [CCAA] members). The inclusion criteria were as follows: a) current player on a male or female collegiate volleyball team and b) aged 18 years or older at the time of data collection. The target sample size ($N = 84$) was based upon a fixed alpha level ($\alpha = 0.05$), a medium effect size ($r = 0.15$), a conservative power estimate ($\beta = .80$), and the statistical analyses undertaken (Cohen, 1992).

Measures

Demographics. Participants were asked to self-report variables such as age, gender, ethnicity, height/weight, position, and starting status (see Appendix A). These characteristics allowed for a comprehensive description of the sample.

Basic Psychological Need Satisfaction. Four instruments were selected as indices of psychological need fulfillment:

Competence. A modified 6-item subscale (i.e., perceived competence) from the Intrinsic Motivation Inventory (IMI; McAuley, Duncan, & Tammen, 1989; see Appendix B) was used to assess the satisfaction of the need for competence (C; sample item, "I am pretty skilled at volleyball"). Responses were indicated on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Support for the reliability of the IMI perceived competence subscale has been demonstrated in the realm of sport (Reinboth & Duda, 2006; Reinboth et al., 2004).

Autonomy. Following the work of Reinboth and colleagues (2004), satisfaction of the need for autonomy (A) in sport (sample item, "In volleyball, I am free to express my ideas and opinions") was tapped by a 7-item modified version of the Basic Need Satisfaction at Work Scale (Deci et al., 2001; see Appendix C). Responses were made across a 7-point Likert scale. Support for the structural validity of this modified scale in a sample of adolescent athletes has been documented (Reinboth et al., 2004)

Relatedness. Following adaptations to the sport setting, the 8-item relatedness (R) subscale of the Basic Need Satisfaction at Work Scale (Deci et al., 2001; see Appendix D) was utilized (sample item, "I really like the people I train with at volleyball"). Responses were indicated on a 7-point Likert scale anchored at the extremes of 1 (*not at all true*) and 7 (*very true*). Support for the reliability of this subscale has been demonstrated in exercise settings (Edmunds, Ntoumanis, & Duda, 2006a; Edmunds, Ntoumanis, & Duda, 2006b).

Basic Need Satisfaction in Sport Scale (BNSSS; Gillet et al., 2008). In conjunction with the adapted assessments of need fulfillment, the BNSSS was utilized in an effort to establish preliminary construct validity support. The BNSSS (Gillet et al., 2008) has been published in French with an English translation afforded by the authors for the purposes of this investigation. The 15-item BNSSS (Gillet et al., 2008; see Appendix E) was used to tap the fulfillment of basic needs for competence (sample item, "Often, I do not feel very competent"), autonomy (sample item, "I feel free to express my choices"), and relatedness (sample item, "I have a lot of sympathy for the persons with whom I interact") in sport across a Likert scale ranging from 1 (*not at all true*) to 7 (*completely true*). All items were preceded by the stem, "When I play volleyball." Data derived from the French version has demonstrated levels of internal consistency (Cronbach α; Cronbach, 1951) ranging from 0.71 to 0.82 (Gillet & Rosnet, 2008).

Hedonic Well-being. Participants completed the short form version of the Positive and Negative Affect Schedule (PANAS; Mackinnon, Jorm, Christensen, Korten, Jacomb, & Rodgers, 1999; see Appendix F). Indicative of the affective appraisal aspect of SWB, the PANAS is a 10-item (sample positive item, "Inspired"; sample negative item, "Upset") instrument designed to assess the intensity associated with two dimensions (i.e., positive and negative) of global affect. Items were presented following a contextual stem "This scale consists of a number of words that describe different feelings and emotions. Please answer the following questions by considering how YOU TYPICALLY feel when participating in volleyball using the scale provided." and were assessed across a 5-point Likert scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). Initial reliability

and validity for the PANAS short form version has been noted (Mackinnon et al., 1999) in young adults within the context of physical activity (Wilson et al., 2006).

Eudaimonic Well-being. Two scales were completed as indices of eudaimonic well-being; the 7-item state level version of the Subjective Vitality Scales (SVS; Ryan & Frederick, 1997; see Appendix G) and the state version of the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003; see Appendix H). The SVS assessed the degree to which individual's feel alive and alert (i.e., to have energy available to ones' self; sample item "… I feel alive and vital") on a Likert scale ranging from 1 (*not at all true*) to 7 (*very true*). The 5-item state level MAAS (sample item "… I find it difficult to stay focused on what's happening in the present") tapped how attentive and aware one is of what is presently taking place (Brown & Ryan, 2003) across a Likert scale ranging from 1 (*not at all*) to 7 (*very much*). As no context specific instrument of either the SVS or the MAAS has been published, the state versions were modified. The state SVS and MAAS stems were altered to fit with the context of sport (i.e., "When I play volleyball,"). Validity and reliability support for the SVS (Ryan & Frederick, 1997) within exercise (Wilson et al., 2006) and sport (e.g., Reinboth & Duda, 2006) contexts has been documented. Brown and Ryan (2003) demonstrated preliminary support for the reliability of the state MAAS in a sample of young adults.

Procedures

Following ethical clearance, collegiate volleyball league head coaches were contacted via electronic mail (i.e., e-mail) and informed of the study's purpose (see Appendix I). If willing to aid in the recruitment process, head coaches either a) forwarded an e-mail list of athletes on his/her roster or b) agreed to face-to-face recruitment.

Whether contacted via e-mail or in person, athletes were presented with a letter of information (see Appendix J) followed by a letter of informed consent (see Appendix K). Upon attaining informed consent, participants were asked to complete the paper-and-pencil or on-line version of the questionnaire on one occasion. Hard or electronic copies of the layperson synopsis were distributed to coaches and participants whom made a debriefing request.

Data Analyses

Data analyses progressed in sequential stages. Preliminary data analyses were conducted to assess patterns of missing values, univariate normality (i.e., skewness and kurtosis) of relevant variables, and estimates of internal consistency (i.e., Cronbach's α; Cronbach, 1951). Descriptive statistics (e.g., means and standard deviations) and Pearson (*r*) bivariate correlation coefficients were then calculated across all variables of interest. As an exploratory analysis, convergent/divergent validation between the BNSSS scores and those from the adapted scales used to assess basic psychological need fulfillment were explored employing Pearson (*r*) bivariate correlation coefficients. The BNSSS scores were not utilized for the main analyses which aimed to address the hypotheses posed. To assess balanced need satisfaction, Sheldon and Niemiec's (2006) approach was utilized. The absolute difference between each pairing of needs was calculated and used to obtain a score of total divergence (TD). Each individual's TD score was then subtracted from the highest TD score in the dataset such that higher balanced need scores represent better balance. Lastly, separate hierarchical multiple regressions, including the examination of statistical assumptions and the calculation of effect sizes, were conducted. In each equation, the criterion variable was a marker of well-being, either hedonic or

eudaimonic. To predict well-being, basic psychological need fulfillment was entered in Step 1 followed by the addition of balanced need satisfaction in Step 2. Practical significance of each step of the regression equations was determined through the calculation of Cohen's (1988) f^2 statistic.

Results

Recruitment Overview

Eighty-two CCAA volleyball coaches were contacted via an electronic invitation (Dillman, 2006). Of those contacted, twenty seven ($n_{\text{Ontario College Athletic Association}} = 17$) agreed to allow recruitment of their athletes ($N_{\text{athletes contacted}} = 312$), two denied the invitation, and the remainder did not respond to the invitation. Athlete face-to-face recruitment was most effective with a response rate of ninety two percent (91.91%; $n = 182$) versus e-mail based recruitment (38.60%; $n = 44$). The response rate regardless of recruitment method was 72.26 percent with a total of 226 collegiate volleyball players consenting to participate in this investigation. Participant responses on psychological variables did not differ significantly across questionnaire medium (i.e., paper-and-pencil or on-line; Cohen's $d = -0.44 - 0.18$; Cohen, 1988).

Preliminary Analyses

Of those providing consent, data was screened for non-respondents and patterns of missing data. Seven participants were identified as non-respondents with three providing consent only and four missing responses on one or more scales comprising psychological variables. With the non-respondents removed, the total sample size was $N = 219$. Inspection of the remaining participant responses indicated minimal evidence of non-response error on demographic and psychological variables (i.e., 0.00% to 2.70%).

Examination of the pattern of missing data demonstrated no evidence of systematic non-response and consequently, missing data were treated as random. For psychological variables, missing values were replaced employing a within person mean substitution protocol (Hawthorne & Elliot, 2005). Missing data imputation techniques were not performed on demographic or sport experience variables. Consequently, sample size fluctuated across these variables in subsequent analyses. Continuous variables demonstrated minimal deviation from normality (Skewness = -0.96 – 1.09; Kurtosis = -0.40 – 2.90; Glass & Hopkins, 1996). Estimates of internal consistency (i.e., Cronbach's α; Cronbach, 1951) ranged from $\alpha_A = 0.54$ to $\alpha_{SVS} = 0.88$.

The convergent validity coefficients (cv_r) between the responses to each BNSSS subscales and the adapted instruments were as follows: a) $cv_r - C = 0.61$; b) $cv_r - A = 0.60$; c) $cv_r - R = 0.78$. Divergent validity coefficients ranged from 0.40 to 0.55. Patterns of association with well-being indicators were generally demonstrated in a similar direction and magnitude to the adapted assessments of basic psychological need satisfaction (i.e., independently and balanced; see Table 1).

Sample Characteristics

Affiliated with one of CCAA members, collegiate volleyball players ($N = 219$; 57.8% females[2]) ranging in age from eighteen to twenty eight years ($M = 20.03$; $SD = 1.82$) participated in this investigation. The majority of participants identified their ethnicity as "Caucasian/White" ($n = 195$; 89.9%) followed by "Other" ($n = 14$; 6.50%), "Asian" ($n = 6$; 2.80%), and "Aboriginal" ($n = 2$; 0.90%). Participant body mass index (BMI) ranged from 17.58 to 31.71 kg/m^2 with male ($M = 23.80$ kg/m^2; $SD = 2.35$) and female ($M = 21.82$ kg/m^2; $SD = 1.95$) participants on average classified in the *normal*

BMI range at the time of data collection (Health Canada, 2009). Participants reported playing with their current collegiate volleyball team for approximately twelve months which equates to two seasons (M =11.22; SD = 7.70; range = 0 to 34 months). Combined, middle and left side positions accounted for more than half of the reported playing positions (55.50%) while setters, liberos and right side positions comprised forty percent (40.40%) and four percent (4.10%) reported two or more positions played regularly. Over half of the participants reported themselves as starters (60.60%) trailed by non-starters (21.60%), infrequent starters (17.00%) and those who indicated uncertainty of starting status (0.90%).

Overall, participants reported that their basic psychological needs were relatively satisfied (i.e., above mid-point levels) in the context of volleyball (see Table 2). Fulfillment of the psychological need for relatedness was most strongly endorsed followed by competence and autonomy. Participants generally felt vital, mindful, and reported positive affect when engaged in volleyball; whereas, negative affect was minimally endorsed (see Table 2).

Bivariate Correlations

The satisfaction of basic psychological needs in volleyball demonstrated a pattern of positive moderate associations (r = 0.42 – 0.53). Unlike competence and relatedness, the satisfaction of the need for autonomy demonstrated a positive relationship with balanced need satisfaction (see Table 2). Associations between the indices of well-being were small (Cohen, 1988), with exception of the vitality-positive affect relationship (r = 0.73), and were in the expected direction (see Table 2). Greater fulfillment of each basic psychological need in volleyball contexts were associated with heightened levels of

vitality, mindfulness, and positive affect with mindfulness demonstrating the weakest association. Small-to-moderate negative relationships were demonstrated between each basic psychological need and negative affect (r = - 0.25 – - 0.43) in volleyball contexts. Unlike the small negative relationships found across balanced need satisfaction and the majority of well-being indices, mindfulness demonstrated a weak (Cohen, 1988), albeit statistically non-significant, positive association with balanced need satisfaction (see Table 2).

Hierarchical Multiple Regressions

Compliance of the data with the five assumptions for multiple regression analyses were assessed in accord with Tabachnick and Fidell's (2001) recommendations. The ratio of participants to independent variables was 54.75:1. Results stemming from the evaluation of multivariate outliers lead to the deletion of participants greater than three standard deviations from the mean in each respective regression (i.e., 2 multivariate outliers were deleted from each of the SVS, PA, and NA regressions and 3 from the MAAS regression). Independent variables were not highly correlated (i.e., $r < 0.80$) and variance inflation factors (VIF; VIF = 1.29 – 2.64) were not suggestive of concerns specific to singularity or multicollinearity (Kutner, Nachtsheim, & Neter, 2004). Visual inspection of LOESS curves on bivariate scatter plots demonstrated minimal deviation from linearity. No evidence of heteroscedasity was revealed through visual inspection of residual scatter plots (Tabachnick & Fidell, 2001). Independence of errors were assessed with Durbin-Watson's statistic and ranged from 1.71 to 1.97 (Tabachnick & Fidell, 2001).

A series of hierarchical multiple regressions were conducted. Markers of eudaimonic and hedonic well-being served as the dependent variables and independent (Step 1) and balanced need fulfillment (Step 2) entered as the independent variables.[3] The fulfillment of basic psychological needs in a volleyball context was predictive of vitality ($F(3, 213) = 40.36$, $p = 0.00$; $R^2_{adj} = 0.35$) with each need implicated as a significant predictor ($\beta_C = 0.29$, $p = 0.00$; $\beta_A = 0.25$, $p = 0.00$; $\beta_R = 0.21$, $p = 0.00$). Balanced need satisfaction accounted for additional variance ($R^2_{adj} = 0.37$) beyond the independent contributions of psychological need fulfillment as entered in Step 1. Autonomy and competence were statistically significant positive predictors, whereas, balance was a significant negative predictor (see Table 3). Mindfulness was predicted by independent and balanced need satisfaction ($F(3, 212) = 4.09$, $p = 0.01$; $F(4, 211) = 3.67$, $p = 0.01$, respectively) with balanced need fulfillment ($R^2_{adj} = 0.05$) accounting for one percent more variability than independent contributions ($R^2_{adj} = 0.04$). The need for autonomy was the only statistically significant predictor in Step 1 ($\beta_A = 0.20$, $p = 0.01$). With the addition of balanced need satisfaction in Step 2, no individual predictor retained statistical significance (see Table 4).

Hedonic markers of well-being were assessed through consideration of positive and negative affect (see Tables 5 & 6, respectively). With respect to positive affect, both independent and balanced regression equations were statistically significant ($F(3, 213) = 28.95$, $p = 0.00$, $R^2_{adj} = 0.28$; $F(4, 212) = 22.92$, $p = 0.00$, $R^2_{adj} = 0.29$, respectively). In Step 1, competence and relatedness ($\beta_C = 0.32$, $p = 0.00$; $\beta_R = 0.22$, $p = 0.00$) significantly contributed the prediction equation. With the addition of balanced need satisfaction, competence ($\beta_C = 0.31$, $p = 0.00$) and autonomy ($\beta_A = 0.23$, $p = 0.01$) served

as statistically significant predictors. Independent psychological need fulfillment in volleyball contexts was predictive of negative affect ($F(3, 213) = 18.45$, $p = 0.00$, $R^2_{adj} = 0.20$) and remained significant following the addition of balanced need satisfaction in Step 2 ($F(4, 212) = 13.95$, $p = 0.00$, $R^2_{adj} = 0.19$). Autonomy served as a statistically significant predictor in Steps 1 and 2 of the regression equation. Save for mindfulness (i.e., $f^2 = 0.06$), Step 1 of each regression equation demonstrated medium to large effect sizes ($f^2 = 0.27 - 0.56$; Cohen, 1988). In Step 2, additional practical significance was exhibited for each positive psychological well-being index ($f^2 = 0.01$ - 0.03) with total f^2 statistics ranging from 0.07 to 0.59.

Discussion

Study Overview

The aim of this investigation was to examine the fulfillment of basic psychological needs as a mechanism to promote psychological well-being in a sample of collegiate volleyball players. Proponents of BNT (Deci & Ryan, 2002) contend that the fulfillment of each basic psychological need facilitates psychological well-being. Although researchers (e.g., Reis et al., 2000) have examined this tenet across various domains, including physical activity (e.g., Standage & Gillison, 2007), the current investigation aimed to extrapolate upon previous empirical work through a) the employment of a unique sampling frame in a sport context, b) inclusion of varied markers of well-being, as well as, c) the contribution of balanced need fulfillment, alongside the independent effects, on well-being. Results garnished additional support for theoretical propositions advanced by SDT (Deci & Ryan, 2002) and insights for future theoretical/empirical study advancement. The fulfillment of the basic psychological needs

was generally associated with superior well-being outcomes in volleyball contexts. However, balanced need satisfaction demonstrated minimal association and predictive power with eudaimonic and hedonic indices of psychological well-being.

Situating Descriptive Information in Previous Literature

Consistent with previous research (e.g., Amorose et al., 2009), participants self-reported above midpoint levels of basic psychological need fulfillment. In the context of volleyball, participants most strongly endorsed relatedness fulfillment followed by perceived competence and autonomy. Within sport based BNT literature, relatedness and competence tend to be most highly endorsed among participants (Amorose et al., 2009; Reinboth & Duda, 2006; Reinboth et al., 2004; Smith et al., 2007). With respect to psychological well-being, participants demonstrated a profile (i.e., heightened endorsement of positive well-being indices accompanied by a diminished level of negative markers) of psychological wellness in the context of volleyball. As Biswas-Diener and colleagues (2005) noted that the majority of individuals' report being psychologically well, it is not surprising that a similar profile has been demonstrated in the present investigation.

Interpretation of Basic Needs Theory's Focal Claims

Proponents of BNT (Deci & Ryan, 2002) posit that basic psychological need fulfillment is inextricably linked, in a direct and positive manner, to psychological well-being. The relationships between basic psychological need satisfaction and well-being indices, presented in this investigation, were aligned with BNT tenets (Deci & Ryan, 2002) and is typical across various realms of BNT based empirical research (e.g., Reis et al., 2000), including sport (e.g., Reinboth & Duda, 2006). Enhanced vitality, mindfulness,

and positive affect, as well as diminished negative affect, were experienced by those reporting higher levels of basic psychological need fulfillment in the context of volleyball. Consistent with BNT suppositions (Deci & Ryan, 2002), basic psychological need fulfillment significantly predicted psychological well-being in this sample of collegiate volleyball players. Results of this investigation coincide with other sport based publications (e.g., Amorose et al., 2009; Reinboth & Duda, 2006). Not only was variance in well-being accounted for by the fulfillment of basic psychological needs but medium to large practical significance was noted, save for the small magnitude associated with mindfulness (Cohen, 1988).

Overall, consideration of the independent contributions of psychological need fulfillment reinforces and provides additional support for the contentions of BNT (Deci & Ryan, 2002) proponents'. However, one must be cognizant that only subjective vitality was predicted by *each* basic psychological need with the remainder of well-being indices predicted by one or two needs. This trend of varying predictive validity of basic need fulfillment with psychological well-being is not exclusive to this investigation or physical activity contexts (e.g., Deci et al., 2001). Deci and Ryan (2000) have noted that individually basic psychological needs may play more or less proximal roles with respect to psychological well-being promotion and maintenance in different settings (i.e., functional significance of the situation). For instance, Reinboth and colleagues (2004) noted that in the context of sport the functional significance of perceived competence may supersede the importance of perceived autonomy and relatedness. As such, a plausible explanation for the unequal predictive validity of the basic needs with psychological wellness may be that of functional significance.

Consideration of Independent and Balanced Need Fulfillment Contributions

Although SDT proponents (Deci & Ryan, 2000) have yet to stipulate the manner through which basic psychological need fulfillment manifests the most optimal levels of psychological wellness, the majority of empirical research regarding need fulfillment has generally focused on independent contributions. With Sheldon and Niemiec's (2006) conceptualization of balanced need fulfillment, a new line of empirical inquiry requiring empirical investigation emerged. The importance of balanced need fulfillment in relation to psychological well-being is equivocal (Anderson-Butcher & Amorose, 2008; Perreault et al., 2007; Sheldon & Niemiec, 2006). In light of Sheldon and Niemiec's (2006) initial findings, it was hypothesized that participants expressing more balanced need fulfillment would demonstrate superior levels of hedonic well-being. Sheldon and Niemiec (2006) utilized an aggregated marker (i.e., satisfaction with life coupled with positive affect minus negative affect) to represent hedonic well-being and demonstrated a pattern of positive relationships. Results stemming from this investigation are mixed. Support for the direction of association between negative affect and balance need fulfillment was demonstrated, however, it was deemed to be non-significant and reduced the variance accounted for by the overall model. Those reporting higher levels of positive affect demonstrated less balanced (i.e., more variability) need fulfillment which is in stark contrast with Sheldon and Niemiec's (2006) findings.

Formal hypotheses were not forwarded with respect to the relationship between eudaimonic indices and balanced need fulfillment due to a gap in previous literature. A similar conflicting pattern of association noted with hedonic markers was evident across eudaimonic indices. An increase in participant vitality in volleyball contexts was

accompanied by less balanced need satisfaction. Yet, participants that reported being more attentive and aware (i.e., mindful) in volleyball contexts expressed more balanced need fulfillment. Although these contradictions are inherently interesting, the associations were statistically non-significant and require further empirical study.

When balanced need fulfillment was considered alongside independent need contributions on well-being, the overall *F* statistic remained statistically significant. Balanced need satisfaction accounted for one to two percent of the variance across both forms of psychological well-being entertained. These findings replicate those demonstrated in previous literature assessing ill-being in sport (Perreault et al., 2007) and hedonic well-being in university students (Sheldon & Niemiec, 2006) while contrasting Andersen-Butcher and colleagues' (2008) study of motivation and ill-being in athletes. The conceptualization of balanced need fulfillment reflects a theoretically sound extension of SDT (Deci & Ryan, 2002); however, departing from independent assessments of basic psychological need fulfillment, in favor of 'balance,' would be premature based on results from the current study in combination with existing literature.

Potential difficulties concerning the *current* methods employed to acquire a balanced score of need fulfillment have been noted (Perreault et al., 2007; Sheldon & Niemiec, 2006) and fail to acknowledge essential test score characteristics such as the means to calculate estimates of reliability and validity (e.g., convergent). Despite these aforementioned concerns, the *scores* derived from the balanced assessment of need fulfillment generally contributed uniquely to psychological well-being indices beyond independent assessments.

Of note in the present investigation was a trend towards changes in the magnitude of the variance accounted for (as expressed by beta weights) with the addition of balanced need satisfaction on the well-being outcomes of vitality, mindfulness and positive affect. The shift in magnitude was not apparent for perceived fulfillment of the need for competence in volleyball contexts. One feasible explanation includes the notion of suppressor effects, whereby, the addition of balanced need satisfaction alters the contribution of perceived autonomy and relatedness with the dependent variable due to the suppression of irrelevant variance (Pedhazur, 1982).

Results stemming from the present investigation were generally aligned with theoretical tenets (Deci & Ryan, 2002) and study hypotheses with the exception of mindfulness as the outcome variable of interest. Brown and Ryan (2003) contend that mindfulness reflects a dimension of eudaimonic living and advocated for further empirical study of this dimension. Although not focal to the main aim of this investigation, the results concerning basic psychological need fulfillment and contextual mindfulness were noticeably different (e.g., lessened strength of associations) from vitality and positive affect outcomes.

With the adapted instrument comprised entirely of reverse scored items and the sport setting from which participants were responding the results concerning mindfulness may have been adversely affected. First, the purpose of reversing *some* items is to minimize bias in participant responses (i.e., engage the participant's attention to each item; Schriesheim, Eisenbach, & Hill, 1991). As the 'state' scale of mindfulness (i.e., which was adapted to the context of volleyball) employed here is fully comprised of reverse scored items, reverse scoring serves no purpose. Further, reverse scoring remains

controversial in the literature with several academics contesting its appropriateness in psychological assessments (e.g., Schriesheim et al., 1991). For instance, Schriesheim and colleagues (1991) demonstrated that in contrast to their regularly worded items, item reversals generally resulted in reduced reliability and validity estimates. Second, with mindfulness representing how attentive and aware one is of what is presently taking place, Brown and Ryan (2003) hypothesized that mindfulness may aid in the disengagement of habitual behaviour/habits. According to motor learning theories (Fitts & Posner, 1967) and studies on motor behaviour expertise (e.g., Shinar, Meir, & Ben-Shoham, 1998), being 'mindful' in the context of volleyball (i.e., disengagement of habitual behaviour) may conflict with athletic expertise or create confusion amongst participants about what they ought to be experiencing as athletes. Consequently, the role of mindfulness, as an indicator of well-being, within the context of sport has yet to be fully elucidated.

Limitations

While the results of this investigation hold theoretical and practical merit, a number of limitations require acknowledgement to advance our understanding of psychological need fulfillment and well-being in sport contexts. Data collection procedures included a) non-probability based sampling which limits the inferences that can be drawn from statistical tests and claims of external validity (Vincent, 2005); as well as, b) subjective, self-reports, at the exclusion of objective assessments of study variables. Further, the non-experimental cross-sectional design prohibits the delineation of any direct and causal claims (Deci & Ryan, 2002) encompassing the need fulfillment-well-being relationship.

Internal consistency coefficients offered estimates of reliability for test scores provided by this study's sample. While estimates of internal consistency should be based on circumstance as opposed to fabricated cut-points (Lance, Butts, & Michels, 2006; Vandenberg, 2006), potential concerns with the reliability of test scores associated with perceptions of autonomy fulfillment (i.e., Cronbach $\alpha_A = 0.54$; Cronbach, 1951) should be noted. Further, adapted measures were employed to assess the fulfillment of the basic psychological needs for competence, autonomy, and relatedness in the context of volleyball. While such adaptations are not uncommon in sport based BNT literature (e.g., Reinboth & Duda, 2006; Reinboth et al., 2004), the extent to which the items are fully representative and relevant to the targeted construct remains undetermined (Streiner & Norman, 2008). Beyond the three basic psychological needs evaluated herein and perpetually forwarded in BNT based investigations, research (Sheldon, Elliot, Kim, & Kasser, 2001) suggests that additional basic psychological needs may exist. As Deci and Ryan (2002) claim that the fulfillment of each basic psychological need is integral to an individual's psychological well-being, the exclusion of a basic need from statistical analyses may be detrimental to an investigations conclusions. For instance, omitting a basic need from the regression analyses conducted herein may have limited the amount of variance in well-being accounted for by basic psychological need fulfillment with subsequent theoretical ramifications.

Psychological well-being has been construed as a multifaceted construct (Ryan et al., 2008; Ryff & Singer, 2008; Waterman, 1993; 2007). Although multiple markers of psychological well-being were assessed in the present investigation, the full breadth and depth of dimensions demarcating hedonic and eudaimonic well-being was not

represented. Despite these confines, the findings remain pertinent for the expansion of sport based BNT literature by highlighting potential lines of inquiry.

Future Directions

Based on results emanating from the present investigation and identified limitations, the further assessment of unique patterns, methodological considerations, measurement advancements, and inclusion of additional constructs should be undertaken in future empirical investigations. Contextual mindfulness demonstrated lower magnitudes of association with variables of interest in comparison to other positive outcome variables (i.e., subjective vitality and positive affect). As mindfulness has been minimally investigated in sport contexts, the validation of these findings through empirical replication is required (Messick, 1995). Consideration of the content validity of the MAAS in a sporting context would offer insight into the inferences drawn from test scores (Streiner & Norman, 2008). Moreover, the interdisciplinary investigation (i.e., assessing mindfulness in conjunction with athletic expertise—motor learning/behaviour) may further elucidate the distinctive facets of mindfulness in the context of sport.

With the exception of mindfulness and in contrast to independent associations, balanced need fulfillment was negatively related to psychological well-being. The unexpected relationship may be connected to the manner in which balanced need fulfillment was assessed. As the importance of independent versus balanced need fulfillment is still equivocal (Andersen-Butcher & Amorose, 2008; Perreault et al., 2007; Sheldon & Niemiec, 2006), further research is warranted to fully comprehend the niche (i.e., conceptual and methodological roles) that balanced need satisfaction holds with respect to BNT tenets, specifically within sport contexts. When considering independent

contributions of psychological need fulfillment on well-being, differences were noted for the relative importance of perceptions of autonomy (i.e., a central construct within the SDT framework). Unlike subjective vitality, positive affect was not significantly predicted by the fulfillment of autonomy in a volleyball context. With the need for autonomy generally distinguishing between the positive indices of hedonic and eudaimonic psychological well-being in a volleyball context, a potential line of inquiry concerns the notion that basic psychological need fulfillment should influence eudaimonic more so than hedonic markers (Fromm, 1981; Nix et al., 1999; Ryan & Deci, 2001).

Methodological considerations also offer valuable future directions. As typically found within BNT based literature (e.g., Gagné et al., 2003; Wilson et al., 2006), the present investigation assessed psychological well-being via self-report. With objective markers of psychological well-being entertained by various academics (e.g., Hayney et al., 2003; Ryff et al., 2004), future BNT investigations could compliment subjective assessments (i.e., self-report instruments) with biological markers (e.g., salivary cortisol—a stress hormone) of psychological wellness. Moreover, the inclusion of varied eudaimonic and hedonic markers in a single investigation would serve to further delineate their intricate interplay and may allow for the comprehensive evaluation of the robustness regarding the need fulfillment-well-being relationship. Through longitudinal designs, Deci and Ryan's (2002) claim that basic psychological need fulfillment is directly related to psychological well-being may be further substantiated. For instance, conducting experiential sampling/diary designs (e.g., Gagné et al., 2003), may afford for a more robust demonstration of the need fulfillment-well-being relationship by demonstrating

their related patterns of fluctuations. While attempting to understand the basic need fulfillment-well-being relationship, researchers may benefit from efforts to advance the assessment of basic psychological need satisfaction in sport contexts. Streamlining and replication of results stemming from adapted measures employed in sport based literature coupled with the development of sport specific need fulfillment instruments, approximating Gillet and colleagues' (2008) scale, ought to be a central aim of future empirical investigations. Moreover, a continued effort, on behalf of researchers invested in SDT, may be made to delineate and empirically scrutinize other potential basic psychological needs.

Lastly, the results of the present investigation demonstrate that the fulfillment of basic psychological needs in sport based contexts is typically linked with psychological well-being. As such, future investigations ought to build upon existing literature (e.g., Adie, Duda, & Ntoumanis, 2009; Gagné et al., 2003; Reinboth et al., 2004) concerned with the social environment factors which support basic psychological need fulfillment. With autonomy support (i.e., a fundamental factor) examined most frequently (Wilson, Gregson, & Mack, 2009), researchers have begun to delineate social environment factors to support competence and relatedness (e.g., task involving climates, structure, and involvement). Further developing this holistic approach to need fulfillment may allow those involved in competitive sport contexts (e.g., coaches) to improve their athletes' psychological well-being.

Practical Considerations Based Upon the Link between Need Fulfillment and Well-Being

In collegiate volleyball contexts, coaches are the principal authority. Coaches have the power to alter their athletes' social (i.e., sport) environment. To foster

psychological well-being in collegiate level volleyball players, coaches may utilize a variety of strategies evidenced in the literature to support each basic psychological need's fulfillment. As suggested by Deci and Ryan (2002), the focal consideration ought to be facilitating an autonomy supportive environment. These environments include the consideration of your athlete's perspective, the provision of meaningful rationales, opportunities for choice, valuing others, and attempting to minimize external demands (Deci & Ryan, 2002; Reinboth et al., 2004). For instance, designate a part of the allotted practice time to athlete selected and run drills whilst intervening only to afford pertinent and appropriate feedback. To assist in optimizing an athlete's perceived competence and relatedness, coaches may create task involving climates (e.g., self-referencing) while incorporating components of both structure (e.g., comprehensible and realistic expectations) and involvement (e.g., displaying genuine interest; Markland &Vansteenkiste, 2007; Reinboth & Duda, 2006; Standage, Gillison, & Treasure, 2007). Each of the noted strategies should be employed to ultimately encourage the athlete to perceive themselves as the source of their own behaviours (Adie et al., 2009; Deci & Ryan, 2002).

Conclusion

In sum, the present investigation generally afforded support for the study's hypotheses and BNT tenets (Deci & Ryan, 2002). Basic psychological need fulfillment in the context of volleyball was associated with, and predictive of, two forms of psychological well-being. Balanced need satisfaction accounted for additional variance beyond the contributions of each independent need, with the exception of negative affect. The present investigation did little to clarify the equivocal evidence specific to the

meaningfulness of balanced need fulfillment beyond independent contributions which is suggestive of additional thoughtful empirical investigation and theoretical considerations. Further empirical research is required to delineate the specific role played by mindfulness, as an index of well-being, when coupled with basic psychological need fulfillment in a sport context. Through the employment of various strategies, the fulfillment of basic psychological needs may facilitate psychological well-being in sport participants.

Endnotes

[1] The method developed by Sheldon and Niemiec (2006) includes three steps. First, the absolute difference between each pair of needs is calculated (e.g., C = 4, A = 6, and R = 3; CA = 2, CR = 1; AR = 3). Second, add each pairs score together to produce the participants total divergence (TD) score (e.g. CA+ CR + AR = TD; 2 + 1 + 3 = 6). Third, the highest TD score is found in the data set and each TD score is subtracted from this number ($TD_{highest}$ – TD = balanced need satisfaction score). As such, the higher the balance score, the more balanced an individual's need satisfaction.

[2] An independent samples *t*-test revealed no statistically significant ($p > 0.05$) differences by gender (Cohen's d = - 0.14 - 0.08; Cohen, 1988) across study variables.

[3] Independent and balanced regression equations utilizing scores from the BNSSS (Gillet et al., 2008) were predictive of vitality ($F(3, 213) = 38.82$, $p < 0.01$, $R^2_{adj} = 0.34$; $F(4, 212) = 29.29$, $p < 0.01$, $R^2_{adj} = 0.34$, respectively), mindfulness ($F(3, 213) = 8.07$, $p < 0.01$, $R^2_{adj} = 0.09$; $F(4, 212) = 6.03$, $p < 0.01$, $R^2_{adj} = 0.09$, respectively), positive ($F(3, 213) = 28.22$, $p < 0.01$, $R^2_{adj} = 0.28$; $F(4, 212) = 21.19$, $p < 0.01$, $R^2_{adj} = 0.27$, respectively) and negative ($F(3, 213) = 15.23$, $p < 0.01$, $R^2_{adj} = 0.17$; $F(4, 212) = 11.44$, $p < 0.01$, $R^2_{adj} = 0.16$, respectively) affect. Effect sizes for Step 1 of the regression equations ranged from 0.11 to 0.55. With the addition of balanced need fulfillment in Step 2, the effect sizes remained unaltered.

Table 1

BNSSS: Convergent Validity Correlation Coefficients

	1	2	3	4
1. BNSSS-Competence	-			
2. BNSSS-Autonomy	0.47	-		
3. BNSSS-Relatedness	0.45	0.58	-	
4. BNSSS-Balanced Need Satisfaction	0.39	0.38	-0.04	-
5. Vitality	0.34	0.49	0.48	0.11
6. Mindfulness	0.28	-0.01	0.07	0.10
7. Positive Affect	0.41	0.44	0.38	0.18
8. Negative Affect	-0.39	-0.21	-0.17	-0.16

Note. Two-tailed significance of correlations are as follows: $r = |0.16 \text{ to } 0.17|$ are statistically significant at $p \leq .05$; $r \geq |0.18|$ are statistically significant at $p \leq .01$.

Table 2

Descriptive Statistics, Internal Consistency, and Correlation Coefficients of Study Variables

	M	*SD*	Skewness	Kurtosis	1	2	3	4	5	6	7	8
1. Competence	5.43	0.82	-0.78	1.18	0.83							
2. Autonomy	4.61	0.71	-0.23	-0.40	0.43	0.54						
3. Relatedness	5.83	0.90	-0.93	0.33	0.42	0.53	0.85					
4. Balanced Need Fulfillment	7.33	1.40	-0.79	2.90	-0.08	0.29	-0.40	-				
5. Vitality	5.61	0.95	-0.66	0.30	0.48	0.50	0.45	-0.12	0.88			
6. Mindfulness	4.82	1.01	-0.32	0.66	0.03	0.20	0.15	0.08	0.14	0.72		
7. Positive Affect	4.16	0.59	-0.96	1.32	0.45	0.37	0.41	-0.16	0.73	0.14	0.79	
8. Negative Affect	1.92	0.65	0.93	0.56	-0.25	-0.43	-0.27	-0.11	-0.29	-0.31	-0.30	0.75

Note. Internal consistency estimates (Cronbach α; Cronbach, 1951) are placed along the principal diagonal. *M* = Mean; *SD* = Standard Deviation. One-tailed significance of correlations are as follows: $r = |0.12 \text{ to } 0.15|$ are statistically significant at $p \leq .05$; $r \geq |0.16|$ are statistically significant at $p \leq .01$. Two-tailed significance of correlations are as follows: $r = |0.14 \text{ to } 0.17|$ are statistically significant at $p \leq .05$; $r \geq |0.18|$ are statistically significant at $p \leq .01$.

Table 3

Independent and Balanced Need Satisfaction Predicting Vitality

	SVS					
	ΔR^2_{adj}	β	*p*	*F*	Δf^2	95% CI (Lower - Upper Bound)
Step 1	0.35		0.00	40.36	0.56	
Competence		0.29	0.00			0.19 - 0.47
Autonomy		0.25	0.00			0.16 - 0.50
Relatedness		0.21	0.00			0.08 - 0.35
Step 2	0.02		0.00	32.79	0.03	
Competence		0.28	0.00			0.18 - 0.46
Autonomy		0.40	0.00			0.30 - 0.74
Relatedness		0.06	0.51			-0.12 - 0.24
Balanced Need Satisfaction		-0.20	0.01			-0.23 - -0.03

Note. $N = 217$. ΔR^2_{adj} = Change in Adjusted R Squared. β = Standardized Beta Weight. *p* = Probability Value. *F* = F Statistic. Δf^2 = Change in Effect Size. CI = Confidence Intervals.

Table 4

Independent and Balanced Need Satisfaction Predicting Mindfulness

	MAAS					
	ΔR^2_{adj}	β	*p*	*F*	Δf^2	95% CI (Lower - Upper Bound)
Step 1	0.04		0.01	4.09	0.06	
Competence		-0.06	0.42			-0.24 - 0.10
Autonomy		0.20	0.02			0.05 - 0.47
Relatedness		0.09	0.28			-0.08 - 0.26
Step 2	0.01		0.01	3.67	0.01	
Competence		-0.05	0.50			-0.23 - 0.11
Autonomy		0.09	0.38			-0.15 - 0.39
Relatedness		0.20	0.07			-0.02 - 0.42
Balanced Need Satisfaction		0.15	0.13			-0.03 - 0.22

Note. $N = 216$. ΔR^2_{adj} = Change in Adjusted R Squared. β = Standardized Beta Weight. *p* = Probability Value. *F* = F Statistic. Δf^2 = Change in Effect Size. CI = Confidence Intervals.

Table 5

Independent and Balanced Need Satisfaction Predicting Positive Affect

	PA					
	ΔR^2_{adj}	β	*p*	*F*	Δf^2	95% CI (Lower - Upper Bound)
Step 1	0.28		0.00	28.95	0.39	
Competence		0.32	0.00			0.13 - 0.31
Autonomy		0.12	0.09			-0.01 - 0.20
Relatedness		0.22	0.00			0.05 - 0.22
Step 2	0.01		0.00	22.92	0.02	
Competence		0.31	0.00			0.13 - 0.30
Autonomy		0.23	0.01			0.04 - 0.32
Relatedness		0.10	0.28			-0.05 - 0.18
Balanced Need Satisfaction		-0.16	0.06			-0.13 - 0.00

Note. $N = 217$. ΔR^2_{adj} = Change in Adjusted R Squared. β = Standardized Beta Weight. *p* = Probability Value. *F* = F Statistic. Δf^2 = Change in Effect Size. CI = Confidence Intervals.

Table 6

Independent and Balanced Need Satisfaction Predicting Negative Affect

	NA					
	ΔR^2_{adj}	β	*p*	*F*	Δf^2	95% CI (Lower - Upper Bound)
Step 1	0.20		0.00	18.45	0.27	
Competence		-0.08	0.24			-0.17 - 0.04
Autonomy		-0.38	0.00			-0.46 - -0.20
Relatedness		-0.05	0.48			-0.14 - 0.07
Step 2	-0.01		0.00	13.95	0.00	
Competence		-0.09	0.22			-0.17 - 0.04
Autonomy		-0.33	0.00			-0.46 - -0.12
Relatedness		-0.10	0.31			-0.21 - 0.07
Balanced Need Satisfaction		-0.07	0.45			-0.11 - 0.05

Note. $N = 217$. ΔR^2_{adj} = Change in Adjusted R Squared. β = Standardized Beta Weight. *p* = Probability Value. *F* = F Statistic. Δf^2 = Change in Effect Size. CI = Confidence Intervals.

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Appendix A: Demographic Information

Physical Activity & Well-being

About this Study

There are no right or wrong answers to any of these questions. Please read the questions carefully and answer each one according to what is true for you. This is a comprehensive questionnaire and some items may appear similar to each other. Please answer each question to the best of your ability.

Section 1: This first part of the questionnaire is designed to describe the athletes participating in this study. All information received is held in confidence.

Age _____ years

Height _____ Feet/inches _____ Metres

Weight _____ Pounds (lbs) _____ Kilograms (kgs)

What is your gender?

❑ Male ❑ Female

How would you describe your ethnic origin?

❑ Aboriginal ❑ Caucasian/White ❑ Asian ❑ Other

- How many months have you played on the varsity volleyball team for your academic institution? _____ months

- What position do you most frequently play for your college team? (Please circle one of the following options)

  Setter Libero Right Side Left Side Middle

- What is your current starting status on the varsity team at your academic institution?
  (Please check only one of the following options)
  - ☐ Starter
  - ☐ Non-Starter
  - ☐ Sometimes Start, Sometimes don't start
  - ☐ Don't know yet

Appendix B: Intrinsic Motivation Inventory- Perceived Competence

Section 3: The following statements represent different feelings people have when they engage in sport. Please answer the following question by considering how YOU TYPICALLY feel when participating in volleyball using the scale provided.

	Not at all True		Somewhat True			Very True	
I think I am pretty good at volleyball	1	2	3	4	5	6	7
I think I do pretty well at volleyball compared to others	1	2	3	4	5	6	7
After working at volleyball for a while, I felt pretty competent	1	2	3	4	5	6	7
I am satisfied with my performance at volleyball	1	2	3	4	5	6	7
I am pretty skilled at volleyball	1	2	3	4	5	6	7
Volleyball is not something I can do very well.	1	2	3	4	5	6	7

Appendix C: Basic Psychological Needs Scales- Autonomy

Section 4: The following questions concern your feelings about volleyball. Please indicate how true each of the following statement is for you given your experiences on this team. Remember that your coach/teammates will never know how you responded to the questions. Please use the following scale in responding to the items.

	Not at all True		Somewhat True			Very True	
In volleyball, I feel like I can make a lot of inputs to deciding how my play gets done	1	2	3	4	5	6	7
I feel pressured at volleyball	1	2	3	4	5	6	7
I am free to express my ideas and opinions at volleyball	1	2	3	4	5	6	7
When I am at volleyball, I have to do what I am told	1	2	3	4	5	6	7
My feelings are taken into consideration at volleyball	1	2	3	4	5	6	7
I feel like I can pretty much be myself at volleyball	1	2	3	4	5	6	7
There is not much opportunity for me to decide for myself how to go about my volleyball play	1	2	3	4	5	6	7

Appendix D: Basic Psychological Needs Scales- Relatedness

Section 4 continued: The following questions concern your feelings about volleyball. Please indicate how true each of the following statement is for you given your experiences on this team. Remember that your coach/teammates will never know how you responded to the questions. Please use the following scale in responding to the items.

	Not at all True		Somewhat True			Very True	
I really like the people I train with at volleyball	1	2	3	4	5	6	7
I get along with people at volleyball	1	2	3	4	5	6	7
I pretty much keep to myself at volleyball	1	2	3	4	5	6	7
I consider the people I play volleyball with to be my friends	1	2	3	4	5	6	7
People at volleyball care about me	1	2	3	4	5	6	7
There are not many people at volleyball that I am close to	1	2	3	4	5	6	7
The people I play with do not seem to like me much	1	2	3	4	5	6	7
People at volleyball are pretty friendly towards me	1	2	3	4	5	6	7

Appendix E: Basic Need Satisfaction in Sport Scale

When I play volleyball,	Not at all True		Somewhat True			Completely True	
I feel free to express my choices	1	2	3	4	5	6	7
I have a lot of sympathy for the persons with whom I interact	1	2	3	4	5	6	7
Often, I do not feel very competent	1	2	3	4	5	6	7
Generally, I feel free to express my ideas and opinions	1	2	3	4	5	6	7
I have great connections with the persons with whom I interact	1	2	3	4	5	6	7
I feel that I do well	1	2	3	4	5	6	7
I have the opportunity to take decisions about my training program	1	2	3	4	5	6	7
The persons that I mix with like and appreciate me	1	2	3	4	5	6	7
I believe that I can reach the requirements of my training program	1	2	3	4	5	6	7
I am involved in the development of my training program	1	2	3	4	5	6	7
I consider the persons with whom I interact as my friends	1	2	3	4	5	6	7
I do not have a lot of opportunities to show what I am capable of	1	2	3	4	5	6	7
I can give my opinion about the development of my training program	1	2	3	4	5	6	7
I feel at ease with others	1	2	3	4	5	6	7
Often, I feel that I am not very efficient	1	2	3	4	5	6	7

Appendix F: Positive Affect Negative Affect Schedule

Section 5: This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this about volleyball.

	Very Slightly or Not at all	A Little	Moderately	Quite a bit	Extremely
Inspired	1	2	3	4	5
Afraid	1	2	3	4	5
Alert	1	2	3	4	5
Upset	1	2	3	4	5
Excited	1	2	3	4	5
Nervous	1	2	3	4	5
Enthusiastic	1	2	3	4	5
Scared	1	2	3	4	5
Determined	1	2	3	4	5
Distressed	1	2	3	4	5

Appendix G: Subjective Vitality Scale

Section 6: Please respond to each of the following statements by indicating the degree to which the statement is true for you in general in volleyball.

When I play volleyball,	Not at all True		Somewhat True			Very True	
I feel alive and vital	1	2	3	4	5	6	7
I don't feel very energetic	1	2	3	4	5	6	7
Sometimes I feel so alive I just want to burst	1	2	3	4	5	6	7
I have energy and spirit	1	2	3	4	5	6	7
I look forward to each new day	1	2	3	4	5	6	7
I nearly always feel alert and awake	1	2	3	4	5	6	7
I feel energized	1	2	3	4	5	6	7

Appendix H: Mindful Attention Awareness Scale

Section 7: Below is a collection of statements about your volleyball experience. Using the 1-6 scale below, please indicate how frequently or infrequently you have each experience in volleyball. Please answer according to what *really reflects* your experience rather than what you think your experience should be. Please treat each item separately from every other item.

When I play volleyball,	Not at all		Somewhat			Very Much	
I find it difficult to stay focused on what's happening in the present	0	1	2	3	4	5	6
I rush through activities without being really attentive to them	0	1	2	3	4	5	6
I do jobs or tasks automatically, without being aware of what I'm doing	0	1	2	3	4	5	6
I find myself preoccupied with the future or the past	0	1	2	3	4	5	6
I find myself doing things without paying attention	0	1	2	3	4	5	6

Appendix I: E-mail Correspondence Guide for Coaches

"Dear, Coach ____. My name is Kristin Oster and I am an assistant coach of the women's volleyball program at Niagara College. I am currently enrolled in the Masters of Arts program in the Department of Health Psychology and Physical Education in the Faculty of Applied Health Sciences at Brock University. You are being invited to contribute to my graduate thesis project entitled "Collegiate Volleyball Players Need Fulfillment and Well-being." The project is designed to enhance our understanding of basic human needs and well-being in collegiate volleyball players. I am undertaking this research project because despite the central importance of well-being to sport, a minimal understanding of how an athlete can achieve wellness has been addressed. Thus, I am conducting this study to develop a greater understanding of psychological well-being in college level volleyball players. I believe that this will help us gain a greater understanding of the ways in which athletes can foster psychological well-being and potentially improve performance. There are two ways in which you can aid my research efforts; 1) we request that I may distribute the questionnaires following a league/tournament game or in practice or 2) we are requesting an adult (18 years and over) athlete e-mail contact list such that we may invite your team to participate. Your participation is completely voluntary. Of your athletes, I will be requesting that they complete a series of questions that will take approximately 10-15 minutes of their time on one occasion over an internet based survey or in person. Your endorsement is voluntary and all of the contact information that you provide will remain confidential which means that we will not be sharing your players personal contact information with any other person or party in such a manner that they could be identified as a consequence of participating in this project. Nor is it our intent to induce psychological harm upon your athletes through their participation in this research endeavor. Remember that this is a voluntary activity and you are free to not participate by simply deleting this correspondence. If you have any questions please do not hesitate to contact the researchers identified below. Thank you for your help with this project.

Sincerely,

Ms. Kristin Oster, MA Candidate, Dept. of Physical Education and Kinesiology

ko03vh@brocku.ca

Dr. Diane Mack, Associate Professor, Dept. of Physical Education and Kinesiology
Brock University
500 Glenridge Avenue
St. Catharines, Ontario, Canada
L2S 3A1 Phone: 905-688-5550 x4360
dmack@brocku.ca

The study has been reviewed and has received ethics acceptance through the Research Ethics Board at Brock University (File 07-069). Should you have any further questions concerning the study in general please feel free to contact members of the research team by e-mail: Kristin Oster at ko03vh@brocku.ca or Dr. Diane Mack at dmack@brocku.ca. Additionally, concerns about your involvement in the study may also be directed to the Research Ethics Officer in the Office of Research Services at (905) 688-5550 extension 3035.

Appendix J: Athlete E-mail Correspondence/Verbal Guide

Dear Student Athlete,

The research project that you are being invited to participate in is entitled, "Health Enhancing Physical Activity and Well-being." The investigators include a faculty member and a graduate candidate from Brock University whom are interested in the measurement of well-being. The purpose of this study is to examine the basic need fulfillment and wellness in elite volleyball players.

Your involvement and feedback are greatly appreciated and will help to further our understanding of the role needs play in an elite athlete samples wellness. The 67-item questionnaire is expected to take approximately 10-15 minutes to complete. Relevant demographic questions will also be queried. One sample question is "When I play volleyball, I do jobs or tasks automatically, without being aware of what I'm doing."

The sampling frame used for this study represents participants whom are presently listed on a collegiate volleyball roster. Participants were identified via contact with your head coach and you have been selected to receive this invitation to participate. Should you agree, you will be asked to complete a survey on one occasion. Your participation is appreciated and benefits the conclusions derived from the investigation. Should you agree to participate, you will be asked to provide consent using the form following this document.

Results from this study will be used to enhance our understanding of the role of wellness in your life. Should you wish to receive a written summary of the study's findings please fill out the debriefing form at the end of the questionnaire. Further, dissemination of results will occur in academic journals and conference presentations; however, the specific identity of the participants in the study will not be disclosed. Any information that arises from participants will be treated with confidentiality and anonymity. All recorded data will be kept on a secured computer accessible only to members of the research team identified above. Consistent with guidelines, data will be destroyed five years following the completion of the study.

Participation in this study is voluntary and individuals may decline answering any question(s) that they find invasive, offensive, or inappropriate. There are no known psychological or physical risks associated with participation. A list of psychological resources can be found at the end of the questionnaire if you should feel the need to speak with a professional about your arising thoughts and feelings. Of course, you may choose not to participate and will not experience any negative consequences.

The study has been reviewed and has received ethics clearance through the Research Ethics Board at Brock University (File 07-069). Should you have any further questions concerning the study in general please feel free to contact members of the research team by e-mail: Kristin Oster at ko03vh@brocku.ca or Dr. Diane Mack at dmack@brocku.ca. Additionally, concerns about your involvement in the study may also be directed to the Research Ethics Officer in the Office of Research Services at (905) 688-5550 extension 3035.

Thank you for your interest and involvement in this study.
Sincerely,
Ms. Kristin Oster, MA Candidate, Dept. of Physical Education and Kinesiology
Dr. Diane Mack, Associate Professor, Dept. of Physical Education and Kinesiology
Brock University

Appendix K: Letter of Informed Consent

Title of Study: Health Enhancing Physical Activity and Well-being
Principal Researcher: Dr. Diane E. Mack, Department of Physical Education and Kinesiology, Brock University
Co-Investigator: Ms. Kristin Oster, MA Candidate, Faculty of Applied Health Sciences
Contact information: E-mail: ko03vh@brocku.ca; T: (905) 688-5550 ext. 5564

You are invited to participate in a study that involves research. The purpose of this study is to understand the collegiate volleyball players' experiences.
I understand that:

- **I have received and read the Letter of Information provided to me through members of the research team.**
- **I understand that participation will involve the completion of a 10-15 minute questionnaire on one occasion.**
- **I understand that I can choose to decline participation at any time during the research endeavour.**
- **The purpose of this study is to understand basic need fulfillment and well-being.**
- **I understand that no known psychological or physical risks are associated with participation.**
- **I understand that background information request the disclosure of personal information.**
- **I understand that there is no obligation to answer any question that I do not wish to answer.**
- **I understand that members of the research team have secured procedures to ensure participant confidentiality and data anonymity.**
- **I understand that all personal information will be kept strictly confidential.**
- **I understand that my participation in this study is voluntary and that I may withdraw from the study at any time and for any reason.**
- **I understand that only members of the research team named above will have access to the data. Data will be saved onto a password protected computer which will be stored in a locked office at Brock University.**
- **I understand that data will be destroyed five years following completion of the study.**
- **I understand that participants may gain a better understanding of the role wellness plays in their life.**
- **I understand that the results of this study will be distributed in academic journal articles and conference presentations and a summary of the results will be made available to the participants in the study.**
- **As indicated by my consent below, I acknowledge that I am participating freely and willingly.**

I agree to participate in this study described above. I have made this decision based on the information I have read in the Letter of Information and Letter of Informed Consent. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name (please print):	**Date:**
Signature	
If you have any questions about this study or require further information, please contact the Principal Investigator using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (File 07-069). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.	